Open Architecture Principles

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INFRASTRUCTURE ARCHITECTURE PRINCIPLES

IP1. The infrastructure's ability to adapt to user needs is paramount.

Rationale:

- Agency requirements are both unique and dynamic. The infrastructure should support an environment that allows applications to start small, quickly, and inexpensively.

- An adaptable infrastructure provides the capability to add onto the current investment with minimum inconvenience to the user.

- Applications should be able to expand or contract in concert with the demand for services.

- The infrastructure should support applications that are flexible and portable.

Implications:

- Adaptability and life expectancy are major criteria in setting infrastructure standards and selecting components.

- Solutions which demonstrate a growth path and support portability are more likely to be maintained or supported in the future.

IP2. Interoperability is a goal of infrastructure, data management, and applications development.

Rationale:

- Interoperability enhances the ability to share data and other resources which is critical to the effective delivery of services by the State.

- Interoperability fosters better inter-Agency cooperation by eliminating many of the barriers which make inter-Agency efforts difficult.

- By promoting and providing interoperable components, scarce training and support resources can be directed in the most cost-effective manner.

- A consistent user view of the infrastructure leads to productivity gains.

- Interoperability of systems has advantages during disaster recovery and continuity of operations during widespread incident.

Implications:

- An Agency may incur higher initial costs to achieve statewide compatibility. This may delay upgrade for some Agencies. However, this will position the Agency to realize future cost savings.

- Agencies may need budgeting and staffing support to migrate to an infrastructure that supports interoperability.

- State leadership needs to be educated as to the benefits of a common infrastructure so they will support the strategic plan for such an infrastructure.

- Agencies will need to work with their federal funding partners to assure the continuation of matching funds as we move to an infrastructure of greater interoperability.

IP3. The State's infrastructure is based on open technology/architecture.

Rationale:

- Open technology/architecture enables the State to take advantage of industry trends and future technology.
- An open systems approach provides for a better return on investment by prolonging the useful life of infrastructure components. It facilitates the portability of applications to smaller or larger platforms without extensive retooling and increases the likelihood that the replaced hardware can be effectively utilized elsewhere in the organization.

Implications:

- State standards, based on open technology/architecture standards will be developed. Purchasing procedures will incorporate these standards.
- The cost of replacing non-conforming solutions will require us to grandfather current non-conforming products for a period of time while a plan for their replacement is put in place.
- The State needs to maximize use of existing open technology/architecture standards.
- The State strategically will move away from closed / proprietary systems.

IP4. The distribution and interconnection of information technology empowers users.

Rationale:

- The use of appropriate technology, including handheld devices, integrated voice/data devices, intelligent workstations and personal computers in a networked environment, when situations and applications warrant, enhances productivity.
- The availability of computing processing power and network connectivity to users is often a critical part of the appropriate solution of business system needs.
- Increased productivity and improved job satisfaction can result from a work force which is able to take advantage of computing resources, while minimizing the need for using IT specialists.

Implications:

- Users must be trained to use desktop computing power and network capabilities to attain optimal results.
- Some users will proceed with their own development, independent of IT involvement. This could result in greater challenges in enforcement of standards.
- Computer resource location decisions will be based on effectiveness and not unilateral rules.
- The effective management of networks and distributed computing resources will increase the IT workload as the networks and resources increase in size.
- The use of alternative tools as the primary device for some end users may reduce costs.
- Use of wireless network technologies will allow more flexibility and innovation to meet user needs.

DATA ARCHITECTURE PRINCIPLES

DP1. Data owners are responsible for data integrity and distribution.

Rationale:

- Data owners must be accountable for the effective and efficient management of data.
- The accuracy and currency of data are management concerns best handled by data owners and their IT support.

Implications:

- The State needs to develop security procedures and standards which are consistent across the infrastructure.
- The State needs to establish procedures for data sharing.
- For distribution to the public, data owners need to establish fee schedules within freedom of information guidelines and other State and Agency policy.
- A business data owner should be clearly identified for all current and new data sets and they should be made aware of their responsibilities.
- Standardized data integrity checks and audits should be developed.

DP2. The State information is easily accessible.

Rationale:

- The public has a right to expect more and better information.
- The public has right of access to governmental information, except for that information which is confidential by statute or federal requirements.

Implications:

- Agencies need to develop strategies and solutions to allow for easy and convenient public access.
- Agencies need to provide information about the data which is accessible to assist public understanding and minimize misinterpretation.
- Financial and human resource investments will be required if the Agency is to provide easy and convenient public access to its information.

DP3. Data of state level importance is commonly defined and accessible across Agencies.

Rationale:

- Agencies collect data which appears to be similar to data collected by other agencies, but the data is collected for a separate business purpose. Common data definition would facilitate data integrity within an agency and appropriate levels of sharing between agencies.

Comment: Do we really consider the data owners as managers of their data security? Isn't that at least partially a responsibility of the IT staff for data that is on a production server or database?

Comment: What is "state level data"? If we are talking about basic demographic data there are many issues to overcome. We may have multiple address for an individual, all of which are valid, and some can not be made public for personal security reasons.

- Standards for common categories of data collected by Agencies facilitate information exchange and minimize duplicate information or information systems. These common categories are defined as State Level Data.
- State Level Data definition is important to all State Agencies and as such the definitions need to be available, accessible, consistent, and accurate.
- Common definition of data reduces duplication, mismatching, misuse and misinterpretation, promotes inter-Agency cooperation, and facilitates data sharing.
- Standards for collecting and recording State Level Data under common data definitions can reduce acquisition costs and improve opportunities for maximum use of State information.

Implications:
- Establishment of a committee that defines the format for data of statewide importance.
- Subject to appropriate security restrictions, the Agency data owners will make State Level Data available across the enterprise.
- Efforts to coordinate data definitions and eliminate duplication of State Level Data will require close cooperation among Agencies to develop appropriate standards.

DP4. Information systems are developed recognizing the future disposition of data.

Rationale:
- Data is recognized as a valuable asset in statutes for archiving and records management. These statutes apply to electronic as well as paper documents.
- Identifying the useful life of data promotes more effective systems and efficient storage of data which should result in lower storage costs, while providing for future requirements.

Implications:
- Archival and records management considerations have been incorporated into the systems development methodology and need to be applied as systems are developed.
- Archived electronic records need to be as accessible as paper records. This presents some technical challenges regarding equipment/ media compatibility.
- Agency personnel must be trained in archival and records management policies and procedures and State archival and records management staff must be aware of technical considerations.

DP5. Data Owners collect only necessary information and managers seek to minimize the burden for those who must provide it.

Rationale:
- The value of the State's information lies in its application. Information should be collected or created only to the extent that it has use in fulfilling the Agency's mission.
- Data collection should be based on a defined need in order to achieve the most productive use of resources involved in the provider/collection stream.

Implications:

- IT developers and users need to be trained to challenge assumptions requiring the capture of information, testing these assumptions against current and future needs.
- Agencies must coordinate data collection with other Agencies.

DP6. Data is captured once and validated at the source.

Rationale:

- Data which must be re-captured and/or re-keyed multiple times will result in higher error rates and cost of collection.
- To reduce redundancy, errors, and costs, data should be captured as close as possible to the originating source.
- Interpretation questions are most effectively answered at the point of data capture.
- Well-designed processes take into account source data collection.

Implications:

- The State needs to continue to explore and recommend alternative technologies for data capture at the source.
- Data collectors/validators need to understand what the data means and why it is important.
- Solutions must account for an Agency's control of data and statutory responsibilities for data validity even though the data may be collected elsewhere.
- An improved work flow and simplified work process will reduce the resources needed for data capture and increase the availability of data.
- IT developers need to develop work-flow analysis skills and incorporate them into the systems development life cycle.
- Standard metadata should be developed for each data set.

DP7. The State information is a valuable resource which has been entrusted to public officials and must be managed and protected as such.

Rationale:

- Information has value to the State beyond the individual application. Information is key to program planning and decision making.
- Attention should be shifted from technology to the content, quality, use, and value of information.
- Managers are responsible for assuring that information is protected and that controls are in place which assures that information is being collected and used properly.

Implications:

- The State must develop data and information management skills between users and owners including security, back up, and disaster recovery.
- Confidential data needs to be identified and protected.

> **Comment:** Different agencies or programs within an agency can ask for what appears to be the same data/information but because of the reason for the service different data is captured. Some systems collect data/information on a client basis and some on a family perspective. The demographic information may be different.
>
> Also, it needs to be clearly defined who owns the data and can make changes.

- A policy is required to distinguish non-validated, raw data, notes, working papers, etc. from official data and information.
- Privacy issues must first be addressed and shared with the public before data from multiple agencies is combined in new ways.

APPLICATION ARCHITECTURE PRINCIPLES

AP1. Application systems maximize the effectiveness of the user.

Rationale:

- Applications should be driven by the business requirements of an organization and supported by available technology.
- Effective systems aid the delivery of services, maximize the use of high efficiency resources, and respond to user needs.
- An effective user can better serve the customers.

Implications:

- This requires Agency program staff and IT Application Development staff to look beyond how things are being done and at what needs to be accomplished.

AP2. Application systems are developed using standard, common methodologies.

Rationale:

- Standard development methodologies increase the likelihood of high quality results and promote reusable components.
- Training and support economies of scale can be realized by using common methodologies and tools. Training is more apt to be offered and delivered in this environment.

Implications:

- Specific development tools and environments may vary based on specific application needs.
- Systems Development Life Cycle standards must be adaptable to changes in proven industry methodologies and maximize the effectiveness of the development environment.
- Training programs will be required to support standard, common methodologies.
- The IT Application Development staff will be more mobile within the State as the development approach becomes similar across Agencies.

AP3. Agencies employ common user presentation methods within their applications and coordinate presentation methods with other Agencies on multi-Agency systems.

Rationale:

- Common user interfaces increase user productivity and promote interoperability.
- Training economies of scale can be realized by common user interfaces. Training is more apt to be offered and delivered in this environment.

Implications:

- State should strive to develop standards for user interfaces.
- Training programs will be required to support the standards.
- Agency staff will be able to learn to use new systems quicker as the interface will be familiar.

Comment: Who makes the decision of which approach is the best approach when agencies differ on technologies. Many times more than one approach is available.

Comment: This is a possibility but the federal matching funds used pay from 30% to 90% of a staff's salary. This would be lost and 100% state dollars would be required.

Comment: This will be a huge undertaking. Our internal review of Client-Server development standards indicates it will be extremely challenging to accomplish at an agency level, let alone statewide.

- Agencies developing cross-functional systems will need to work together to accommodate differences in user presentation methods.

AP4. Cross-functional application systems are highly encouraged.

Rationale:

- Today there are many common information system needs in the State but few cross-functional systems are available. Those that have been developed have successfully demonstrated the value of this approach.
- There are economies of scale to be realized in systems development and administration by incorporating cross-functional systems.
- Cross-functional systems encourage cooperation between program and IT staffs.
- Multi-Agency efforts should result in increased effectiveness and efficiency.

Implications:

- Systems may cost more in the short-term and take longer to build if obtaining multi-Agency participation. However, more Agencies will benefit from the investment which may, eventually, reduce overall State costs.
- The IT community needs to stimulate the development of cross-functional systems with the support of the Business Community.
- Agencies will need to provide staff resources to guide and support the development of cross-functional systems.

AP5. Application systems are a joint responsibility of program management and IT management.

Rationale:

- It is important that both Agency management and IT staff recognize that they have a stake in the outcome of a development effort.
- An application should maximize functional utility within IT capabilities.
- Application development is an investment which must be jointly managed by the Agency, the business unit, IT management, and IT staff to maximize the return to the Agency.

Implications:

- Both IT and program managers will need to understand applications from the other's perspective. This can only be done through the development of supportive and dependent working relationships over the life of the application.
- IT staff and managers need to understand the mission and program goals of the Agency.
- Program managers need to understand the potential limitations and tradeoffs of technology.

AP6. Management anticipates and plans for the replacement of obsolete application systems.

Rationale:

- Every application has a limited useful life span. Beyond this life span, the application becomes functionally deficient and costly to operate and maintain.

- Planning for the replacement of applications will reduce crisis replacement and maintenance efforts.
- Newer applications can be more responsive to changing requirements by incorporating proven technology in solving program problems.

Implications:

- Systems need to be managed as an asset and linked to program and budget plans in order to obtain executive and legislative support.
- Both Agencies and IT management must work together in the search for the best possible replacement.
- Agencies need to develop priorities for the replacement of obsolete systems.
- Managers must be skilled in analyzing the value of investments in replacement systems.

ORGANIZATION ARCHITECTURE PRINCIPLES

OP1. Information architecture principles provide a framework for Agency management resource decisions.

Rationale:

- The mission and culture of each Agency is best known from within.
- This clarifies and balances the responsibilities between IT Application Development staff and Agencies.
- Establishment of responsibility and authority fosters ownership and facilitates the decision-making process.

Implications:

- Agencies will comply with State-wide policies and standards.
- IT staff needs to provide resources to support Agencies in making information architecture decisions.
- Business program and IT management need to work closely together to insure that resource decisions meet Agency goals.

OP2. IT management participates fully in program planning to maximize Agency effectiveness.

Rationale:

- Technology is becoming increasingly important to the successful operation of the State. It is also of strategic importance to the future well-being of the State.
- Business decisions have technology consequences just as technology decisions have business consequences.
- Joint involvement increases the likelihood of the IT solution to the business problem being funded and reduces the likelihood of last minute, inadequate application support for the solution.

Implications:

- The IT head in each organization needs to be recognized as part of the Agency management team.
- Financial analysis and planning for IT expenditures must be incorporated into the program planning process.
- Both IT and Agency management must make a conscious effort to educate the other about their responsibilities and requirements.

OP3. Management must plan for the impact that changes in information technology have on the organization, its employees, and the public.

Rationale:

- The processes and procedures that humans use to interact with information systems are vitally linked to successful utilization of the information resource.
- Information systems technology has the impact of reducing the manual labor involved in information processing. Employees need to be retrained to work smarter, not harder.
- Proper planning can aid in the understanding of IT capabilities and make it easier to adapt to and implement change.
- Planning for changes in business processes and new technology will help assure realization of expected outcomes.

Implications:

- IT management needs to help business program management understand the changing nature and impacts of IT technology.
- Organizational change issues must be dealt within every systems development project.
- Management must involve all levels of their organization when introducing new technology.

OP4. Information technology planning recognizes and supports the way people work.

Rationale:

- There is great creativity and energy that can be gained by recognizing and enhancing the work group. Information technology should not isolate the worker from peers, supervisors or subordinates.
- Successful computer systems recognize the important role of people in the business processes which they perform.
- The purpose of technology is to support business requirements.

Implications:

- Human systems engineering training may be necessary for IT and program staff.
- End users need to participate in information technology planning.
- Continuous quality improvement efforts are essential in realizing the synergy potential of information systems.

OP5. Standards are reviewed at least every two years within participating State Agencies.

Rationale:

- Standards are best understood and followed when a sense of ownership is evident.
- A collaborative definition of standards is more likely to result in standards which are followed.
- Cooperative development will identify diverse needs as standards are developed and anticipate possible exceptions to the standards.
- Technical standards should recognize individual Agency capabilities, characteristics, and needs as well as the common good.

Comment: The Mainframe IT Process Requirements were submitted for review/audit over 2 years ago and have not heard anything since. If this is an example of multiple agencies agreeing to a set of standards and reviewing them on a regular basis I would not have much faith in this ever materializing.

Implications:

- This requires Agencies to make resources available to participate in the standards process.
- A participatory effort in standards development will result in better acceptance and application of standards.
- Biennial reviews will result in timely revisions of standards where necessary.

OP6. Successful information systems depend on well-trained staff.

Rationale:

- The effective use of methodologies, tools and techniques which can empower developers, and speed delivery and maintenance of the systems, requires timely training.
- Optimal utilization of information systems requires that the users and user managers of such systems understand the processes and procedures necessary to utilize fully the system's capabilities.
- Training is a fundamental ingredient of information systems and therefore, of doing business. Then, the costs of training, both direct and indirect, will be part of Agency planning.

Implications:

- Training investments may rise, but IT staff, users, and Agency management will be better able to take advantage of information systems and technology.
- Well-trained staff needs to be readily available to system users.
- A training plan, including funding, will be developed to support new systems.
- IT management must gain the support of Agency management to achieve the training plan.

OP7. Agency management cooperates and seeks out partnerships with other Agencies in information technology areas.

Rationale:

- Research and development into new technologies is a costly investment. Sharing the cost among Agencies may permit more technology exploration and further the exploitation of promising technologies.
- Economies of scale can be realized by sharing new technology hardware/software platforms.

Implications:

- The IT community needs to work together to identify and develop action plans to explore new technologies.
- Agencies that have implemented new technologies have an obligation to assist other Agencies in applying the technology.
- Agencies need to develop budgeting and accounting solutions for technology sharing.

OP8. Security considerations should be part of all projects, from inception through implementation.

Rationale:

- Security concerns arise throughout IT architecture; including networking, data management, application development, support, training, etc.
- Security is an integral part of business requirements and must be determined at the start of the project as it may impact design and all later phases of the project.
- It is much more expensive to "retrofit" an application or implementation than it is to build security functions in originally.
- Security often crosses architectural elements (e.g. authentication elements in an application development project are influenced by the infrastructure and data architectures of the IT environment) and these crosscutting elements are often lost when decisions have already been made in isolation.

Implications:

- Addressing security needs from the outset of a project may increase cost for early phases, but may also reduce costs at later stages.
- Additional costs for security should decline with time as security standards become part of infrastructure, data, and application standards instead of being independent requirements.